What is claimed is:

1. A polymer having a melt tension (MT (g)) that is substantially the same as or lower than that of a conventional polymer which is substantially the same as the polymer in the recurring unit of the main skeleton, the molecular weight, the molecular weight distribution and the crystallinity, and having a flow activation energy (Ea (KJ/mol)) that is larger than a value obtained by adding 5 KJ/mol to the Ea value of the conventional polymer.

2. The polymer as claimed in claim 1, wherein the recurring unit of the main skeleton is constituted of carbon and hydrogen, and optionally oxygen, and the polymer is substantially thermoplastic.

3. The polymer as claimed in claim 2, wherein the main skeleton is constituted of olefins of 2 to 8 carbon atoms.

4. A branched polyolefin comprising 50 to 100 % by mol of recurring units derived from ethylene and 0 to 50 % by mol of recurring units derived from an α-olefin of 3 to 7 carbon atoms and having the following properties:

the flow activation energy (Ea (KJ/mol)) and the α-olefin content (C (% by weight)) satisfy the following relation:

in the case where the number of carbon atoms of the α-olefin is 3 and $C \geq 10$ % by weight:

$$Ea \geq 0.130 \times C + 28.7,$$

in the case where the number of carbon atoms of the α-olefin is 4 to 7 and $C \geq 4.1$ % by weight:

$$Ea \geq 0.385 \times C + 28.7,$$

in the case where the number of carbon atoms of the α-olefin is 3 and $C < 10$ % by weight (including the case where the α-olefin content is 0), and in the case where the number of carbon atoms of the α-olefin is 4 to 7 and $C < 4.1$ % by weight:

$$Ea \geq 30,$$

and

the melt tension (MT (g)) and the melt flow rate (MFR (g/10 min)) satisfy the following relation:

$$MT \leq 2.2 \times MFR^{-0.88}.$$

5. The branched polyolefin as claimed in claim 4, comprising:

(i) recurring units derived from at least one olefin selected from ethylene and olefins of 3 to 7 carbon atoms, and

(ii) recurring units derived from a vinyl-terminated macromonomer comprising 50 to 100 % by mol of recurring units derived from ethylene and 50 to 0 % by mol of recurring units

derived from an olefin of 4 to 7 carbon atoms, having a weight-average molecular weight of 600 to 3,500 and having less than 0.1 methyl branch, as measured by ^{13}C-NMR, based on 1,000 carbon atoms.

6. A branched polyolefin comprising 50 to 100 % by mol of recurring units derived from ethylene and 0 to 50 % by mol of recurring units derived from an α-olefin of 8 to 20 carbon atoms and having the following properties:

the flow activation energy (Ea (KJ/mol)) and the α-olefin content (C (% by weight)) satisfy the following relation:

in the case of $C \geq 4.1$ % by weight:

$Ea \geq 0.385 \times C + 28.7$,

in the case of $C < 4.1$ % by weight:

$Ea \geq 30$,

and

the melt tension (MT (g)) and the melt flow rate (MFR (g/10 min)) satisfy the following relation:

$MT \leq 2.2 \times MFR^{-0.88}$.

7. The branched polyolefin as claimed in claim 6, comprising:

(i) recurring units derived from at least one olefin selected from ethylene and olefins of 8 to 20 carbon atoms, and

(ii) recurring units derived from a vinyl-terminated macromonomer comprising 50 to 100 % by mol of recurring units derived from ethylene and 50 to 0 % by mol of recurring units derived from an olefin of 3 to 20 carbon atoms, having a weight-average molecular weight of 600 to 3,500 and having less than 0.1 methyl branch, as measured by ^{13}C-NMR, based on 1,000 carbon atoms.

8. A branched polyolefin comprising:

(i) recurring units derived from at least one olefin selected from olefins of 2 to 20 carbon atoms, and

(ii) recurring units derived from a vinyl-terminated macromonomer comprising 50 to 100 % by mol of recurring units derived from ethylene and 50 to 0 % by mol of recurring units derived from an olefin of 4 to 20 carbon atoms, having a weight-average molecular weight of 600 to 200,000 and having less than 0.1 methyl branch, as measured by ^{13}C-NMR, based on 1,000 carbon atoms.

9. The branched polyolefin as claimed in claim 8, wherein the weight-average molecular weight is in the range of 600 to 3,500.

10. A process for preparing a branched polyolefin, comprising polymerizing at least one olefin selected from olefins of 2 to 20 carbon atoms using an olefin polymerization catalyst comprising:

(A) a transition metal compound containing a ligand having cyclopentadienyl skeleton,

(B) a transition metal compound represented by the following formula (I), and

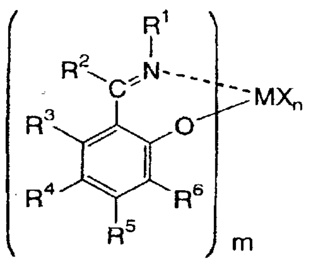
(C) at least one compound selected from:

(C-1) an organometallic compound,

(C-2) an organoaluminum oxy-compound, and

(C-3) a compound which reacts with the transition metal compound (A) or the transition metal compound (B) to form an ion pair,

to prepare the branched polyolefin of any one of claims 4, 6 and 8;



(I)

wherein M is a transition metal atom of Group 4 to Group 5 of the periodic table, m is an integer of 1 to 2, R^1 is an aliphatic hydrocarbon group or an alicyclic hydrocarbon group, R^2 to R^5 may be the same or different and are each a hydrogen atom, a hydrocarbon group, a hydrocarbon-substituted silyl group, an oxygen-containing group, a nitrogen-containing group or a sulfur-containing group, R^6 is a hydrocarbon group or a hydrocarbon-substituted silyl group, n is a number satisfying a valence of M, X is a hydrogen atom, a halogen atom, a hydrocarbon group, an oxygen-containing group, a sulfur-containing group, a nitrogen-containing group, a boron-containing group, an aluminum-containing group, a phosphorus-containing group, a halogen-containing group, a heterocyclic compound residue, a silicon-containing group, a germanium-containing group or a tin-containing group, and when n is 2 or greater, plural groups indicated by X may be the same or different, and plural groups indicated by X may be bonded to form a ring.

11. The process for preparing a branched polyolefin as claimed in claim 10, wherein the polymerization is carried out continuously under at least two different polymerization conditions, and the polymerization includes

polymerization conducted under such condition that the yield of a polymer produced by the transition metal compound (B) becomes higher than the yield of a polymer produced by the transition metal compound (A) and

polymerization conducted under such conditions that the yield of a polymer produced by the transition metal compound (A) becomes higher than the yield of a polymer produced by the transition metal compound (B).